

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
4 October 2001 (04.10.2001)

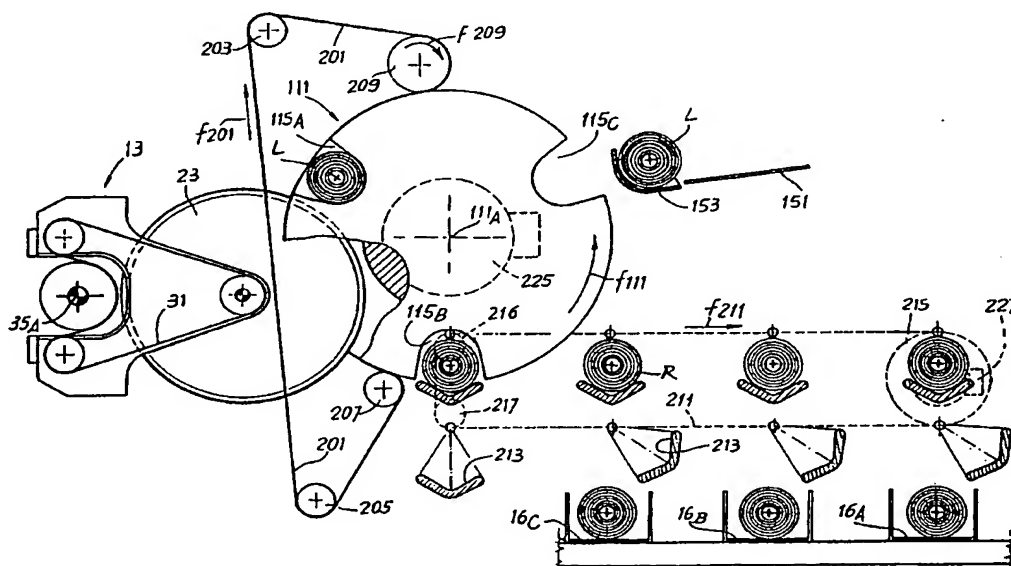
PCT

(10) International Publication Number
WO 01/72482 A1

- (51) International Patent Classification⁷: **B26D 7/06, 3/16**
- (21) International Application Number: **PCT/IT01/00142**
- (22) International Filing Date: **23 March 2001 (23.03.2001)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
F100A000076 **28 March 2000 (28.03.2000)** **IT**
- (71) Applicant (for all designated States except US): **FABIO PERINI S.P.A. [IT/IT]**; Via per Mugnano., I-55100 Lucca (IT).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **BETTI, Giulio [IT/IT]**; Via di Piaggia, 8, Vorno, I-55060 Capannori Lucca (IT). **BENVENUTI, Angelo [IT/IT]**; Via del Chiasso, 327, I-55100 Lucca (IT). **CHIOCCHETTI, Mario, Gioni [IT/IT]**; Via di Tiglio, 612, Pieve di Compito, I-55065 Capannori, Lucca (IT).
- (74) Agents: **MANNUCCI, Michele et al.**; Via della Scala, 4, I-50123 Firenze (IT).
- (81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.**
- (84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).**
- Published:
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: **SEVERING MACHINE FOR ELONGATED ROLLS OF WEBLIKE MATERIAL HAVING MULTIPLE CUTTING BLADES**



(57) Abstract: The severing machine comprises, in combination: a series of cutting blades (23) rotating about respective axes; a feeder (111) rotating about an axis (111A) approximately parallel to the axis of the disk-shaped blades, having at least one peripheral seating (115A, 115B, 115C) for the products (L); a flexible member (201) passed around at least one portion of the periphery of the rotating feeder, in order to retain the products in the respective seating during cutting (Fig.1).

WO 01/72482 A1

WO 01/72482 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

SEVERING MACHINE FOR ELONGATED ROLLS OF WEBLIKE MATERIAL HAVING MULTIPLE CUTTING BLADES

DESCRIPTIONTechnical field

5 The present invention relates to a severing machine for cutting rolls or logs of great length into a plurality of small rolls intended for final consumption, or for cutting other elongate products, especially of weblike material, for example packs of paper napkins or other interleaved articles.

 Machines of this type are commonly used in the paper
10 converting industry for the production of rolls of toilet paper, rolls of kitchen paper and the like, or other paper articles.

State of the art

 In the paper converting industry, and especially in the production of products comprising tissue paper, provision is commonly made for the
15 weblike material to be wound up into logs or rolls of large axial dimensions and diameter equal to the diameter of the finished article. These logs or rolls are subsequently cut into a plurality of small rolls, of axial dimensions equal to the final dimension of the article intended for consumption, by means of severing machines.

20 Typically, in order to perform the cutting of the rolls, use is made of severing machines which possess an assembly rotating or oscillating about a shaft and on which are mounted one or more disk-shaped blades rotating about their respective axes. The movement of the assembly brings the disk-shaped blade(s) mounted thereon to penetrate cyclically into the material
25 forming the roll, which is caused to advance below the rotating assembly. At each cycle of the rotating assembly, at least one small roll is cut from one of the rolls being fed. Normally, a plurality of rolls are caused to advance in parallel and are cut simultaneously with successive passages of the same disk-shaped blade carried by the rotating or oscillating assembly. When the
30 assembly carries two blades, two cuts are made during each cycle.

 An example of a severing machine of this type is described in US-A-5 522 292.

According to another known technology, provision is made to cut each roll into the final number of small rolls in a single pass by means of a series of parallel cutting blades. A severing machine of this type is described in US-A-4 329 895. In this machine, the rolls to be cut are inserted into
5 cradles which advance in a linear manner below a plurality of parallel rectilinear blades inclined relative to the direction of advance of the rolls. The blades all penetrate together and gradually into the material of the roll, cutting the latter into a series of small rolls during a single pass.

Another example of a severing machine which allows the
10 simultaneous cutting of each roll into a plurality of small rolls is described in IT-B-1 103 635. In this known machine, a rotating assembly presents the individual rolls, which are accommodated in respective seatings, to a set of rotating blades. The rotating blades have a shape such as to penetrate gradually with their cutting edges into the thickness of the rolls.

15 These multiple severing machines are not sufficiently efficient to meet current high productivity requirements. At present, therefore, preference is given to systems which perform the cutting of the rolls in successive operations of "slicing" the rolls.

Moreover, the multiple-cutting machines known today are
20 complex and bulky, and do not meet present-day safety standards.

Objects and summary of the invention

It is an object of the present invention to provide a machine of the abovementioned type having multiple blades, with a new system for retaining the products to be cut, during cutting, which makes the machine
25 efficient and structurally simple.

It is a further object of the present invention to provide an improved severing machine having multiple blades for the simultaneous cutting of a series of small rolls from rolls or logs of wound-up weblike material or for the cutting of other articles from elongate products, which is of simple
30 and compact construction.

These and other objects and advantages, which will become apparent to those skilled in the art from reading the text that follows, are

substantially achieved with a severing machine for elongate products, comprising, in combination:

- a series of cutting blades rotating about respective axes of rotation;
- a feeder rotating about an axis approximately parallel to the axes of the disk-shaped blades, having at least one peripheral seating for said products, which removes said products from a removal zone and transfers them to said blades for cutting;
- a flexible member passed around at least one portion of the periphery of the rotating feeder, in order to retain the products in said at least one seating during cutting.

The rotating feeder comprises, preferably, more than one seating, more rapid operation thus being obtained. The cutting blades are, according to the preferred embodiment of the invention, disk-shaped blades, in other words having a circular cutting edge, although this is not strictly necessary. They could, for example, have a cutting edge in the form of a portion of a helix.

According to a possible embodiment of the invention, the flexible member comprises at least one continuous belt, passed around at least two return pulleys and, along a section between said two pulleys, around a portion of the peripheral development of the rotating feeder, said rotating feeder having an approximately cylindrical lateral surface along which opens said at least one seating for the products to be cut.

Further advantageous embodiments of the severing machine according to the invention are indicated in the attached dependent claims.

Brief description of the drawings

The invention will be better understood with reference to the description and the attached drawing, which shows a practical non-limiting embodiment of the invention applied to a severing machine for rolls or logs of weblike material. More specifically, in the drawing:

Fig. 1 shows a lateral view of the severing machine; and
Figs 2A-2E show successive phases of the release of the cut small rolls into the unloading channels.

Detailed description of the preferred embodiment of the invention

The severing machine possesses (Fig. 1) a cutting unit 13 having a series of disk-shaped blades 23, rotating about a common axis (or, possibly, about respect axes which are not aligned but are approximately mutually parallel), driven, by means of belts 31, by a motor shaft 35A. Fig. 1 shows a lateral view wherein only one of the rotating disk-shaped blades 23 can be seen, the others being masked and not visible. In practice, along the axis of rotation, which extends orthogonally to the plane of the figure, rotating disk-shaped cutting blades are arranged in a sufficient number to subdivide each roll into the desired number of small rolls and to cut off the head and tail trimmings of the roll. The cutting unit may also comprise a plurality of series of cutting blades that can be employed in alternation.

The rolls or logs L coming from a storage unit (not shown), or from another feed system, are taken from a rotating feeder 111, which rotates - with continuous or intermittent motion - about a horizontal axis 111A. The rotating feeder 111 has a cylindrical development, along which are formed three seatings 115A, 115B and 115C, which can be adapted if necessary - with inserts or the like - to the diameter of the rolls. Each seating 115A, 115B and 115C receives the rolls or logs L from a rotating or oscillating distributor 153 which takes them from a chute 151 associated with the storage unit. The feeder also possesses annular grooves for the passage of the blades, visible in the zone shown in section.

The rotating feeder 111 is encompassed, over an appropriate arc and on the side facing the cutting unit 13, by a plurality of belts or equivalent continuous flexible members, designated 201. Only one of said belts is visible in Fig. 1, the others being arranged along the same path and therefore behind that shown in Fig. 1, at appropriate distances so as not to interfere with the cutting blades.

The belts 201 are passed around wheels or pulleys 203, 205, 207 and 209 with fixed axes. The retaining member formed by the belts 201 is therefore fixed relative to the rotating feeder 111, in the sense that the latter remains in the same spatial position, although moving along the transmission

path defined by the pulleys and the rotating assembly.

As is clearly apparent in the drawing, the belts 201 constitute a retention system which retains each roll L fed by the rotating feeder 111 to the cutting unit 13 for the entire period necessary to perform the cutting of the rolls L into small rolls R and until the unloading position is reached.

Arranged below the rotating feeder 111, in the example shown, is a flexible member 211 which bears a plurality of oscillating cradles 213 which are movable along the closed path defined by said flexible member 211, passed around wheels 215, 216 and 217. Below the system of mobile oscillating cradles 213 are arranged three unloading channels 16A, 16B and 16C, equipped with respective outward conveyor belts.

With this configuration, as will be clarified below, the small rolls transported by the rotating feeder 111 are released after cutting to the oscillating cradles 213 and released from there in threes into the three unloading channels 16A, 16B and 16C, so that the conveyor belts within the latter can move at a speed one third of that which would be necessary to remove all the small rolls if the latter were unloaded into a common channel.

Figs. 2A through 2E show the sequence for releasing the rolls from the rotating feeder into the unloading channels in a possible form of embodiment. As is apparent by comparing the sequence of positions shown in Fig. 2, the rotating feeder 111 unloads the various series of cut small rolls R successively into the various cradles 213. The latter are caused to advance stepwise in a manner such as to present an empty cradle on each occasion below the seating 115A, 115B or 115C. The cradles 213, in other words those that contain the cut small rolls R, are transferred stepwise from the upper strand of the flexible member 211 to the lower strand thereof, in alignment with the unloading channels 16A, 16B and 16C. Once three cradles 213 are located above the three unloading channels 16A, 16B and 16C, the latter are simultaneously caused to oscillate in order to release the three series of small rolls R into the unloading channels 16A, 16B and 16C, where the respective conveyor belts remove said small rolls in a direction orthogonal to the plane of the figure.

It will be understood that the movements of the cradles 213, of the flexible member 211 and of the rotating feeder 111 can also be differently phased, the distances between the cradles 213 on the flexible member 211 being modified as appropriate.

5 In the example shown, the rotating feeder 111 is caused to rotate by a motor 225 and transmits the motion to the belts 201, which may or may not be toothed, in order to interact with a corresponding peripheral toothing of the feeder 111. A second motor 227 supplies the motion to the wheel 215 and thence to the flexible member 211. The two motors 225 and
10 227 are synchronized with one another in order to obtain the correct transfer of the rolls, for example by means of an electronic control. The possibility of a mechanical connection, for example by means of an intermitter or a mixed linkage, for example using epicycloidal gears and correcting motors, is not ruled out.

15 It is understood that the drawing shows only a simplification, provided solely by way of a practical demonstration of the invention, the latter being capable of being varied in shapes and arrangements without thereby departing from the scope of the idea underlying said invention.

CLAIMS

1. A severing machine for the simultaneous cutting of elongate products into series of articles, comprising, in combination:

- a series of cutting blades rotating about respective axes;
- 5 • a feeder rotating about an axis approximately parallel to the axis of the disk-shaped blades, having at least one peripheral seating for said products, which removes said products from a removal zone and transfers them to said blades for cutting;
- a flexible member passed around at least one portion of the periphery of
10 the rotating feeder, in order to retain the products in said at least one seating during cutting.

2. Severing machine as claimed in claim 1, wherein said rotating feeder possesses a plurality of seatings for said products.

3. Severing machine as claimed in claim 1 or 2, wherein said
15 cutting blades are disk-shaped blades.

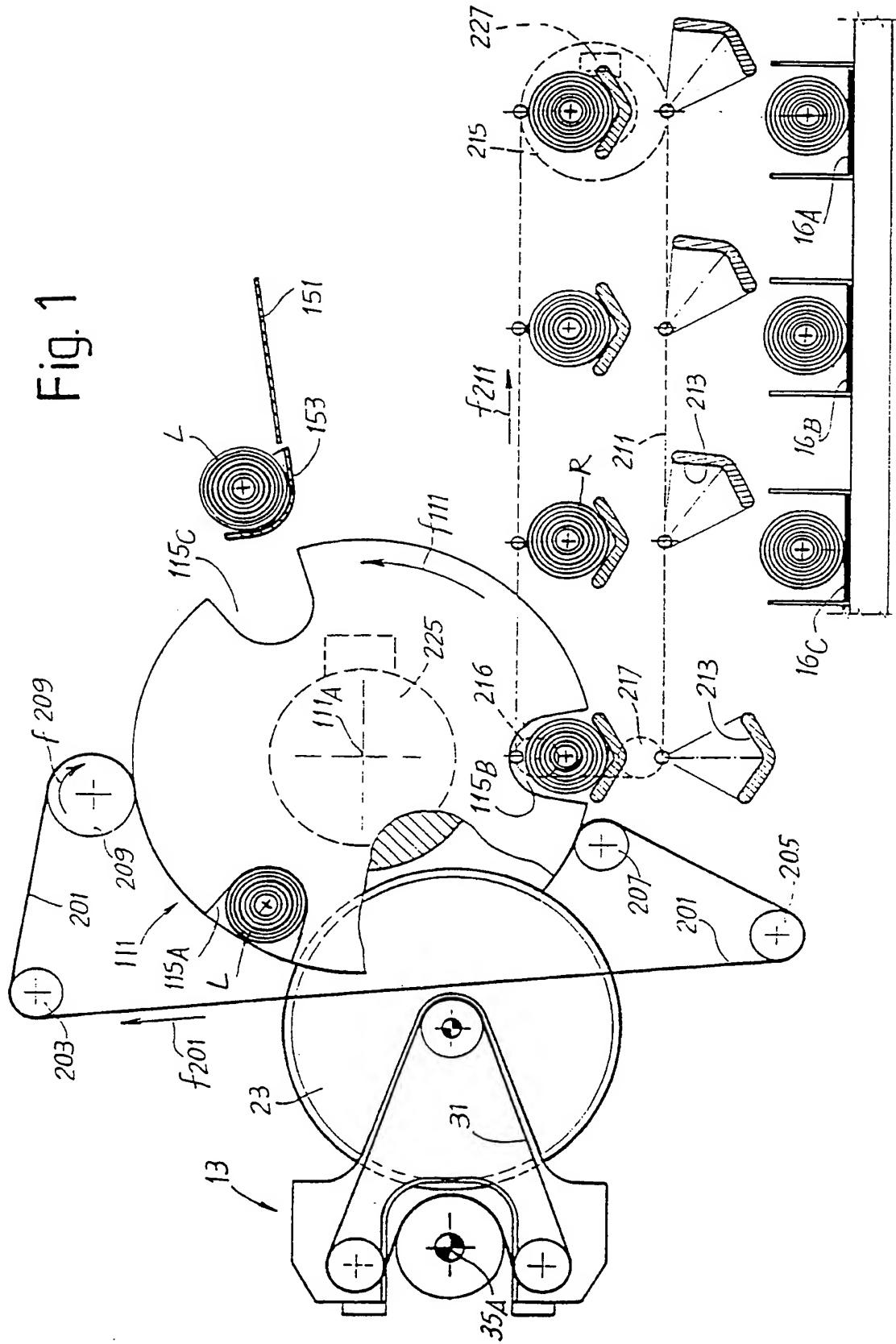
4. Severing machine as claimed in claim 1, 2 or 3, wherein said flexible member comprises at least one continuous belt, passed around at least two return pulleys and, along a section between said two pulleys, around a portion of the peripheral development of the rotating feeder, said rotating
20 feeder having an approximately cylindrical lateral surface along which opens said at least one seating for the products to be cut.

5. Severing machine as claimed in one or more of the preceding claims, wherein at least one unloading channel for the cut articles is disposed downstream of the flexible member, relative to the direction of rotation of the
25 rotating feeder.

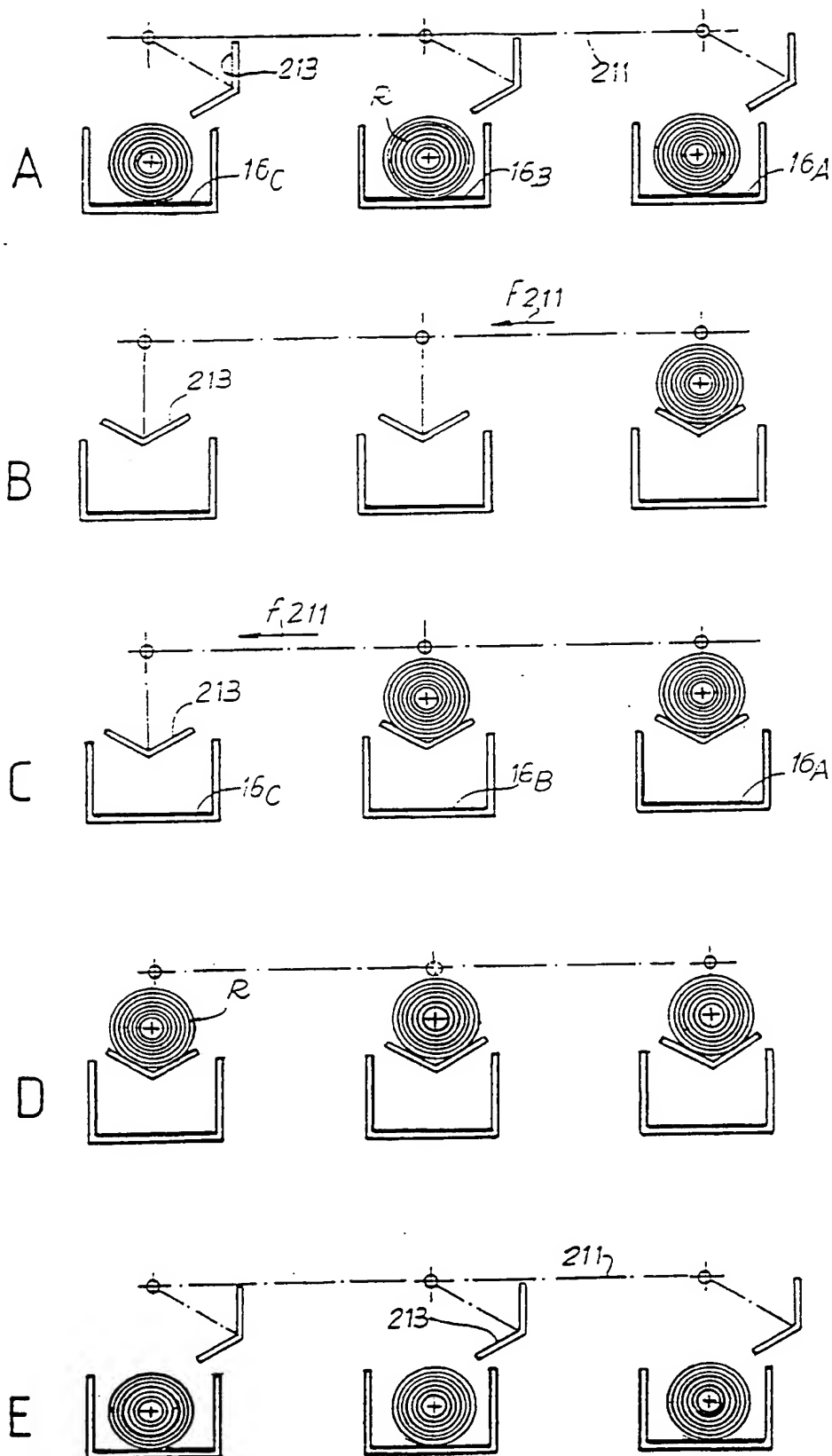
6. Severing machine as claimed in claim 5, wherein a loading zone for the products to be cut is arranged upstream of the flexible member, relative to the direction of rotation of said rotating feeder.

7. Severing machine as claimed in one or more of the preceding
30 claims, wherein the axis of rotation of said rotating feeder is horizontal.

Fig. 1



2 / 2



INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 01/00142

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B26D7/06 B26D3/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B26D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	IT 1 103 635 B (PERINI FABIO) 14 October 1985 (1985-10-14) cited in the application page 6, line 1 - line 6; figure 2 ---	1-3,5-7
A	US 4 329 895 A (PERINI GUGLIELMO) 18 May 1982 (1982-05-18) cited in the application ---	
A	US 5 522 292 A (BIAGIOTTI GUGLIELMO) 4 June 1996 (1996-06-04) cited in the application ---	
A	EP 0 611 637 A (PERINI FABIO SPA) 24 August 1994 (1994-08-24) page 1, column 1, line 45 -column 2, line 3; figure 4 --- -/--	4

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

13 July 2001

Date of mailing of the international search report

20/07/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Rabolini, M

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 01/00142

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 357 833 A (BIAGIOTTI GUGLILEMO) 25 October 1994 (1994-10-25) column 1, line 25 - line 37; figure 6 -----</p>	1,4

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT 01/00142

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
IT 1103635	B	14-10-1985	NONE
US 4329895	A	18-05-1982	NONE
US 5522292	A	04-06-1996	IT 1247330 B 12-12-1994 US 5799555 A 01-09-1998 AT 125186 T 15-08-1995 BR 9201176 A 01-12-1992 CA 2064671 A 04-10-1992 DE 69203508 D 24-08-1995 DE 69203508 T 08-02-1996 EP 0507750 A 07-10-1992 ES 2074861 T 16-09-1995 IL 101371 A 24-06-1994 JP 5192897 A 03-08-1993 KR 9705777 B 21-04-1997 US 5315907 A 31-05-1994
EP 0611637	A	24-08-1994	IT 1265844 B 12-12-1996 AT 161463 T 15-01-1998 BR 9400500 A 23-08-1994 CA 2115498 A,C 16-08-1994 DE 69407445 D 05-02-1998 DE 69407445 T 16-07-1998 ES 2110728 T 16-02-1998 GR 3026001 T 30-04-1998 IL 108550 A 15-04-1997 JP 6253998 A 13-09-1994 KR 163081 B 15-12-1998 US 5647259 A 15-07-1997
US 5357833	A	25-10-1994	IT 1252472 B 16-06-1995 BR 9202959 A 30-03-1993 CA 2074621 A,C 01-02-1993 IL 102602 A 04-08-1996 JP 2721772 B 04-03-1998 JP 5208395 A 20-08-1993 KR 133347 B 24-04-1998 AT 133363 T 15-02-1996 DE 69207837 D 07-03-1996 DE 69207837 T 21-11-1996 EP 0526412 A 03-02-1993 ES 2082436 T 16-03-1996 GR 3018792 T 30-04-1996